September 23, 1997

AG Communication Systems

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Office of the Secretary
FCC
1919 M St. NW Room 222
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Re: CC Docket 96-45, DA 97-1957

Attached are AG Communications Systems' comments to the above captioned request for comments on the possible exhaustion of the Universal Service Fund.

AGCS proposes that the Commission mandate the use of new technology Broadband Access systems by Common Carriers to provide Internet Access Services for Schools, Libraries and Rural Health Care Providers.

When used as the deployment platform for computer access services, this new technology system allows our nation's Communications and Internet Service Providers to connect the beneficiaries of the USF at prices which are at a fraction the price required by today's vintage services which use dated communications technologies. Representative prices for multi-megabit per second ADSL services are in the range of $75 to $125 per month, with vintage T-1 access pricing out at $300 to $800 per month.

If adopted, this recommendation carries the potential to prevent the exhaustion of the Universal Service Fund. As has been the last 20 years' history in electronic technology, we again see the old saw of: "in with the new, out with the old and the price goes down a lot."

For questions or to request our presence to deliver comments at any hearing you might call on the subject, please contact me at 602-582-7755 or e-mail burker@agcs.com.

regards,

R M Burke II

Robert M. Burke, II
ATIUM Marketing Director

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AG Communications Systems Comments on Universal Service Fund

Common Carrier Docket 96-45, DA 97-1957

I. Overview

The multi-media educational and health care applications available today provide the rich content which facilitates high quality computer-aided curriculum and the enhanced delivery of health care. These applications have created a great deal of additional traffic as they have grown in popularity and become indispensable tools. The traffic streams produced by these applications are orders of magnitude greater than those of just 3 or 4 years ago. The reason – multi-media pictures and motion that enriches information content.

This combination of high-traffic applications and their accelerated use have created a much greater need for broadband networking services. The Internet is presently plagued by long waits because low speed analog and ISDN telephone switching technologies are used as the delivery platform. These delivery platforms were designed and put into service in the days when multi-media was not used and when motion was only on the television.

Asymmetric Digital Subscriber Line (ADSL) technology has recently emerged as the preferred broadband access method by which carriers provide high-speed access to business and residential communities and users. Internet (and Intranet) applications are becoming a fundamental part of our lifestyle in educational, professional and home environments. It's crucial that the communications platform used to provide access to those applications be designed for today, not just designed for the services of yesteryear.

II. Vintage Technology Underpins our Telecom Infrastructure

The switched telephone network was introduced over a century ago to carry low frequency voice traffic from mouths to ears. Today, it uses switching technology optimized for that use. Despite many well intentioned attempts to adapt it to today's data networking service needs, the fact remains that the fundamental

building blocks are low capacity channels optimized for voice service transport. It will never be capable of cost effectively transporting high speed computer traffic.

It's like using a model T in the Indianapolis 500. We appeal to the Commission to order some Indy cars so we can win the race.

III. Congestion Follows Vintage Technology in the Network

Continued use of the switched voice telephone network for computer traffic has created costly congestion and presented the FCC, the States' PUC's and the Courts with another problem to solve: the Common Carriers want someone to pay the freight -- namely the ISP's and their customers. However, no one wants to because it represents a significant financial burden.

A second set of busy hours has emerged in the evening as analog or ISDN based modem calls to the Internet have sky-rocketed in volume. In addition to the volume of calls, the duration of these kind of calls are on the order of 10 times the duration of voice calls. To support this traffic Telephone Companies have significantly augmented their trunking networks, with no end in sight.

And no matter what they do, the telephone access network will always present users with unacceptably low speeds. The alternatives available to Schools, Health Care providers and businesses in general today are to connect with costly T-1 facilities, which deliver high speeds and can handle the multi-media traffic destined to their LANs of PC's but at a cost of hundreds of dollars monthly.

There are no alternatives available to consumers and students while at home because the cost of T-1 based services are completely out of their reach.

IV. New Technologies Finally Converge for Internet Telecom Infrastructure

Several new technologies have finally matured to the point that Common Carriers and ISPs may begin to deploy them as parts of their delivery networks.

A. Large Scale Servers

Multi-media content requires very high capacity disk farms, serviced by multi-processor computers. These are now available from many sources at costs within reach of content providers, whether they be commercial services, government agencies, entertainment or electronic commerce services offered by individual companies.

B. Multimedia Enabled High Capacity Local Area Networks

LANs capable of transporting the data produced by high traffic multimedia applications are as important as the high capacity servers in delivering the information for presentation to clients. Vintage Ethernet and token ring LANs work well for text, motionless graphics and low quality motion. But constant bit rate services needed for good quality motion and voice, especially when interactive in real time, demands the use of reserved bandwidth, realtime protocols, or Asynchronous Transfer Mode (ATM) technologies. Plainly put, the vintage LAN uses a communications method which regulates the flow of data by starting, stopping and resuming. This works just fine when real time motion and interactive speech are not involved. The technique was designed in a world without these demands and new LANs may now be deployed by Content Providers and ISPs to deliver motion and speech with quality.

C. Multimedia Enabled High Capacity Wide Area Networks

WANs capable of transporting the data produced by high traffic multimedia applications are at the core of the infrastructure needed to transport multimedia applications data between high capacity servers and clients. Vintage IP Router based WANs work well for text, but the high volumes of data transported for graphics and the constant smooth throughput needed for good quality motion and voice, especially when interactive in real time, begs the use of reserved bandwidth, realtime protocols, or ATM in WAN. Plainly put, vintage IP based WAN's use the same communications method as vintage LANs to regulate the flow of data by starting, stopping and resuming. Furthermore, the latency inserted by these networks as they perform routing functions at each juncture cannot be overcome without some basic protocol changes. As expected, without

these changes, the effective throughput of the network is limited to a fraction of the fundamental network capability. Plainly put, the more routers in a data path (or router hops) between a client and a server, the longer the data transport takes. This is one of the three main causes of the well known "World Wide Wait." Applying newer technology to the WANs will solve this problem by reducing processing latency and re-transmission. These technologies are now available to deploy as the Information Super Highway's fast lane.

D. Broadband Access to the Information Super Highway

Broadband Access systems using ADSL technologies for the final "last mile" link to clients are also available for Carriers to deploy. This final link, or Super Highway On-ramp completes the high capacity network needed for the multi-media applications which Schools, Rural Medical Service providers and Students at home need. These applications are delivered by multi-megabit per second Asymmetric Digital Subscriber Line (ADSL) based components that provide a 1 to 6 Megabit downstream path to the end-user and a several hundred kilobit to 1 Megabit per second return path over a single twisted-pair – all while maintaining normal "lifeline" phone service on the same line. The data rates provided by these broadband access systems are at least 10 times faster than ISDN on the downstream path and 50 times faster than a 33.6K bps modem. Furthermore, these devices have been designed to match the traffic symmetries observed in multi-media applications in a client-server environment.

The architecture of these broadband access systems is relatively simple. They have an ADSL "modem" on each end of a standard twisted-pair telephone line. The "modem" at the client end may connect to the Client LAN (perhaps in a school or library) or be embedded in a single PC at a student's home or medical provider's office. At the Carrier's Central Office or Digital Loop Carrier (DLC) unit, the broadband access system is connected to the high capacity WAN. The WAN then transports the data to the Client from the Content or Internet Service Provider, where it originates from the Large Scale Server.

E. Cost Implications and Impact on the Universal Service Fund

AGCS and others have extensively studied the costs associated with Broadband Internet Access Service delivery. The Service envisioned is the high speed Internet equivalent to local telephone service. It is a switched multi-megabit per second connection which is available on a full time flat rate basis or alternatively on a consumption basis. All data transport within the local service area (like a town, city or extended calling area) is included. It is for use in connecting the Client to one or many local ISPs or Content Service points of presence. The ISP or content service then extends to the Internet from there, as is done today.

Based upon the observed needs for extending and enhancing information access for educational and business reasons, a number of Carriers in the US and Canada have begun the process of rolling out this service. Others are planning it and several are waiting for pricing and provisioning issues to be settled first.

After careful consideration of the end-to-end network that must be acquired, including all network equipment, fiber transport facilities, use of twisted pairs, the costs of power, air conditioning, floor space, maintenance, installation, service activation, depreciation and profits, the price for Broadband Internet Access Service to clients compute as follows: (these prices match those of some Carriers).

Client	Installation	Monthly	Notes
Large Business or School	$275	$125	10 to 100 PC's on a LAN
Small Business or Library	$175	$75	up to 10 PC's on a LAN
Residence	$125	$40	Single PC

The prices may be lower if there is significant residential penetration because 85% of the volume revealed by our market research lies in that area. The demand for residential subscription cross-utilizes the same network infrastructure as daytime school and business clients use, but at different times. Thus creating significant economies in core backbone infrastructure costs.

Furthermore, the major cost component of Broadband Internet Access Service is the allocation charged for use of the local twisted pair loop from the carrier's central office to the customer's premises. This is the same wire which today provides the customer's telephone service. Our price computation allocates $12 per month for the use of the local twisted pair (TWP), which is actually a near zero cost item since it is recovered by the existing telephone service. Reducing the TWP cost allocation would, according to our market research, dramatically raise the penetration in the residential market. Such cost savings could be passed on to end-user clients, thereby reducing the overall price of the service and cost of the subsidies paid by the USF.

In contrast, T-1 Access Service is presently priced anywhere from $300 to $800 per month, which varies from state-to-state, for an equivalent Business connection to a local Content Service or ISP point of presence. The closest equivalent residential telephone connection is ISDN at 1/10th the speed for $30 to $75 per month. Bear in mind that with its significantly reduced bandwidth and

worsened stress on network congestion, ISDN will not be sufficient for most of the applications that students will want as soon as next year.

The positive overall macro-economic impact to the USF is then easily computed. According to the Department of Education, there are roughly 75,000 elementary and secondary schools in the US. We estimate the number of Libraries to be in the range of 15,000. Ignoring Rural Health Care providers, we now calculate the range of expenditures eligible for USF subsidy that would receive a savings from subscription to Broadband Internet Access Service if available.

	Monthly Cost		Average Monthly Cost	Broadband Monthly Cost		x12	Annual	
Total Schools	T-1 Service		Broadband	Difference			Savings	
& Libraries	Min	Max		Min	Max		Min	Max
75,000	$300	$800	$125	$175	$675		$150M	$600M
15,000	$300	$800	$75	$225	$725		$ 40M	$130M
90,000							**$190M**	**$730M**

The average subsidy payable by the USF lies somewhere in the range of 40% to 60%. Therefore, the USF will be spared the expenditure of $75M to $300M annually in subsidies by the subscription of its' beneficiaries to Broadband Internet Access Services. We estimate the savings to increase by $15M to $60M if the PUC's or the FCC were able to implement rate restructure for cable pair use by Broadband Internet access Service. These added savings are achieved by eliminating a "double-cost" charge because copper plant cost recovery is already being made with existing voice services which use the same wire pair.

V. Conclusions

A. All of the requisite components are available to provide Broadband Internet Access Service.

B. Broadband Internet Access Service saves the Universal Service Fund hundreds of millions of dollars annually.

C. Today's vintage switched telephone network is already unsuitable for Internet Access and cannot effectively support emerging multimedia applications.

D. ***The USF realizes additional savings by regulations which encourage Carriers to introduce Broadband Internet Access Service and at attractive residential rates which promote lower costs by cross-utilization of the network infrastructure.***

E. ***The FCC is in a position to promulgate regulations which promote the most cost effective use of the USF possible by encouraging the introduction of broadband Internet Access Service.***

F. ***It is in the Public interest to do so for educational purposes and for development of the US economy through the labor productivity gained from improved information access, enriched information content, and eliminating wait on the Web.***

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LEACO Purchases AG Communication Systems' ATIUM® GateWay to Provide High-Speed Internet Access for New Mexico Students

PHOENIX, Sept. 22, 1997 — AG Communication Systems announced today LEACO Rural Telephone Cooperative, Inc., of Lovington, N.M., has purchased the ATIUM GateWay digital subscriber line (xDSL) end-to-end solution to provide high-speed Internet access for schools in southeastern New Mexico. LEACO will expand access to its business and residential customers in the near future.

"We're a small rural telecommunications company providing 21st-century communications features to our customers – thanks to the help of partners like AG Communication Systems," said Marian Anderson, LEACO manager. "Lightning-quick Internet access places a wealth of knowledge at the fingertips of our school children. These services will allow our kids to compete and excel in today's high-tech world."

"ATIUM GateWay transfers data at speeds 100 times faster than today's analog modems," said Bob Burke, ATIUM marketing director for AG Communication Systems. "Using ATIUM GateWay eliminates significant waits for data to be delivered. New multimedia applications, including distance learning and video conferencing, are now feasible. In addition, ATIUM GateWay allows telephone companies like LEACO to relieve congestion on their networks caused by circuit-switched analog modem and ISDN Internet traffic."

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AG Communication Systems installed ATIUM GateWay asymmetric digital subscriber lines (ADSL) to New Mexico schools in Lovington, Hobbs and Tatum in late July. Additional ADSL lines will be installed this month to connect schools in Dexter, Eunice, Hagerman and Jal. Schools will be able to serve up to 100 users per single ADSL connection to the network. LEACO is using AG Communication Systems' unique GateSpan DS-1 circuit cards to move data between its central telephone offices. This allows various remote systems – separated by as much as 100 miles in LEACO's case – to be connected to a single shelf.

"ATIUM GateWay is a complete broadband access solution for providers and customers of multimedia services," said Burke. "The power of ATIUM GateWay lies in securely delivering switched high-speed data for a wide range of applications."

"Our priority is to help schools get connected to the Internet quickly and cost effectively," said Betty Jones, marketing director at Aries Technology, Inc. Aries Technology supported LEACO in its introduction of ADSL technology for educational Internet access in its service area. "Every school I visited spoke highly of LEACO's involvement in education. I wish every telephone company had the same concern and dedication for today's students as LEACO."

AG Communication Systems offers ATIUM GateWay in multiple configurations. All use asynchronous transfer mode (ATM) in the wide area network (WAN) and deliver Internet Protocol (IP) to customer local area networks (LAN).

- **GateWay Integrated** is a plug-in solution for AG Communication Systems' GTD-5® EAX digital central office (CO) switch.
- **GateWay Universal** is the IP over xDSL solution for today's routed IP backbone and 10BaseT LAN environment. It delivers data to the telephone network over an integrated T1 WAN card.
- **GateLite** is an environmentally hardened digital loop carrier solution.
- **GateWay II** is an ATM-based digital subscriber line access multiplexer (DSLAM) that delivers ATM over xDSL to customer's premises.

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With ATIUM products, customer premises equipment may be deployed as needed to deliver a range of broadband services from voice through video. LEACO delivers service with the GateWay Universal configuration.

LEACO Rural Telephone Cooperative, Inc., has provided telecommunications services to its customers in southeastern New Mexico for more than 40 years. Additional information is available on the company's web site at www.leaco.net.

Aries Technology, Inc., of Tempe, Ariz., distributes and supports educational computer network services for elementary and secondary school users (K-12), from faculty and students to support personnel. Aries provides total Internet solutions from the data line to the desktop, including hardware, software, training and connection. Additional information is available on the company's web site at www.aries.net.

AG Communication Systems is a leading developer and manufacturer of advanced telecommunication products and services, including access, wireless and intelligent network products. AG Communication Systems' GTD-5 digital switching systems serve more than 17 million customers worldwide in business, industry and government, as well as subscribers serviced by the public telephone network. The 100-year-old company had more than $300 million in sales in 1996. Additional information is available on the company's web site at www.agcs.com or by calling 1-888-888-AGCS.

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